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Editorial

Intelligent Marine Robotics Modelling, Simulation and Applications

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Creating this inaugural Special Issue on Intelligent Marine Robotics Modelling, Simulation, and Applications is important due to the rapid technological advancement and the aim to reduce human involvement via artificial intelligence. Marine robots are commonly used to carry out several tasks in deeper and riskier areas where divers are not possible. However, there are several challenges in operating it precisely, including unpredictable disturbances such as the sea current and wave during operation, and the uncertain dynamic model for designing typical guidance, navigation, and control systems. To circumvent these challenges, the robots have to be intelligent in the sense of having conscious thought to allow them to make decisions that impact their performance and action. There are many successful applications of artificial intelligence algorithms; genetic algorithms, neural networks, and fuzzy logic have been proposed for environment exploration, surveillance missions, and collaborative operations. However, the implementation of these robots is still facing numerous challenges such as uncertainties in the harsh environment in the field of advanced control systems, human-robot interaction, fast computational time, robust communication network and rapid implementation with ease of future maintenance in mind.

This Special Issue contains 12 papers [1–12] with recent findings in the field of underwater vehicles, including the sliding mode control in the backstepping framework, unmanned systems, obstacle avoidance, 5-GHz wireless local area network systems for near-shore operations, manipulator, path planning, fault-tolerant control and human-robot interaction. These papers demonstrated the relevant technologies, enhancing prototyping, simulation, dexterity, and user experience. Beyond the engineering system, this issue also includes the use of machine learning to model and study the typhoon in coastal areas using data gathered from volunteered geographic information that sometimes uses marine robotics for remote data collections.

In summary, this issue concluded the uses of intelligent algorithms for marine systems. We must continue to progress in our search for more advanced marine systems design and simulation. The progress reported in this Special Issue suggests that achieving these aims is an attainable ambition. We hope to make this world a better place for a deep collaborative research.

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References

1. Shen, H.; Iorio, J.; Li, N. Sliding Mode Control in Backstepping Framework for a Class of Nonlinear Systems. *J. Mar. Sci. Eng.* **2019**, *7*, 452. [CrossRef]
2. Chen, Y.; Liu, Y.; Meng, Y.; Yu, S.; Zhuang, Y. System Modeling and Simulation of an Unmanned Aerial Underwater Vehicle. *J. Mar. Sci. Eng.* **2019**, *7*, 444. [CrossRef]
3. Lin, X.; Wu, J.; Qin, Q. A Novel Obstacle Localization Method for an Underwater Robot Based on the Flow Field. *J. Mar. Sci. Eng.* **2019**, *7*, 437. [CrossRef]
4. Yu, J.; Zhao, Q.; Chin, C.S. Extracting Typhoon Disaster Information from VGI Based on Machine Learning. *J. Mar. Sci. Eng.* **2019**, *7*, 318. [CrossRef]
5. Yamamoto, B.; Wong, A.; Agcanas, P.J.; Jones, K.; Gaspar, D.; Andrade, R.; Trimble, A.Z. Received Signal Strength Indication (RSSI) of 2.4 GHz and 5 GHz Wireless Local Area Network Systems Projected over Land and Sea for Near-Shore Maritime Robot Operations. *J. Mar. Sci. Eng.* **2019**, *7*, 290. [CrossRef]
6. Zhang, M.; Liu, X.; Tian, Y. Modeling Analysis and Simulation of Viscous Hydrodynamic Model of Single-DOF Manipulator. *J. Mar. Sci. Eng.* **2019**, *7*, 261. [CrossRef]
7. Fan, J.; Li, Y.; Liao, Y.; Jiang, W.; Wang, L.; Jia, Q.; Wu, H. Second Path Planning for Unmanned Surface Vehicle Considering the Constraint of Motion Performance. *J. Mar. Sci. Eng.* **2019**, *7*, 104. [CrossRef]
8. Li, J.-H.; Kim, M.-G.; Kang, H.; Lee, M.-J.; Cho, G.R. UUV Simulation Modeling and its Control Method: Simulation and Experimental Studies. *J. Mar. Sci. Eng.* **2019**, *7*, 89. [CrossRef]
9. Sands, T.; Bollino, K.; Kaminer, I.; Healey, A. Autonomous Minimum Safe Distance Maintenance from Submersed Obstacles in Ocean Currents. *J. Mar. Sci. Eng.* **2018**, *6*, 98. [CrossRef]
10. Barbalata, C.; Dunnigan, M.W.; Petillot, Y. Coupled and Decoupled Force/Motion Controllers for an Underwater Vehicle-Manipulator System. *J. Mar. Sci. Eng.* **2018**, *6*, 96. [CrossRef]
11. Chiarella, D.; Bibuli, M.; Bruzzone, G.; Caccia, M.; Ranieri, A.; Zereik, E.; Marconi, L.; Cutugno, P. A Novel Gesture-Based Language for Underwater Human–Robot Interaction. *J. Mar. Sci. Eng.* **2018**, *6*, 91. [CrossRef]
12. Capocci, R.; Omerdic, E.; Dooly, G.; Toal, D. Fault-Tolerant Control for ROVs Using Control Reallocation and Power Isolation. *J. Mar. Sci. Eng.* **2018**, *6*, 40. [CrossRef]